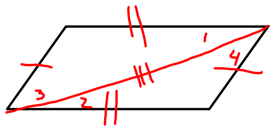
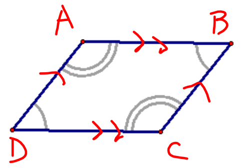
8.3 Tests for Parallelograms

Theorem 8.9 If both pairs of opposite sides are congruent, then the quadrilateral is a parallelogram.



Theorem 8.10 If both pairs of opposite angles are congruent, then the quadrilateral is a parallelogram.



$m\angle A + m\angle B + m\angle C + m\angle D = 360$

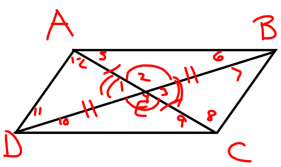
$m\angle A + m\angle B + m\angle A + m\angle B = 360$

$2m\angle A + 2m\angle B = 360$

$m\angle A + m\angle B = 180$

$m\angle C + m\angle B = 180$

Theorem 8.11 If the diagonals bisect each other, then the quadrilateral is a parallelogram.

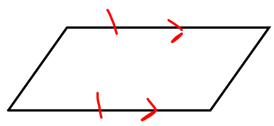


G: $\overline{AE} \cong \overline{EC}$, $\overline{BE} \cong \overline{ED}$

P: ABCD is a ▱

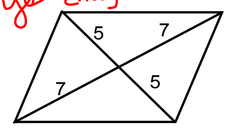
St.	Reasons
①	① Given
② $\angle 2 \cong \angle 4$, $\angle 1 \cong \angle 3$	② Vert. ∠s ≅
③ $\triangle AEB \cong \triangle CED$, $\triangle AED \cong \triangle CEB$	③ SAS
④ $\angle 5 \cong \angle 9$, $\angle 12 \cong \angle 8$	④ CPCTC
⑤ $\overline{AB} \parallel \overline{DC}$, $\overline{AD} \parallel \overline{BC}$	⑤ If alt int ∠s ≅, then lines ∥.
⑥ ABCD is a ▱	⑥ def of ▱

Theorem 8.12 If one pair of opposite sides is both congruent and parallel, then the quadrilateral is a parallelogram.

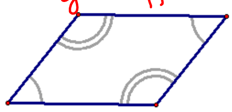


Are the following parallelograms? Why?

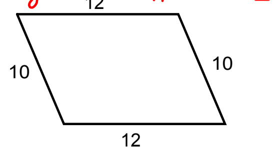
yes diag. bis. each other



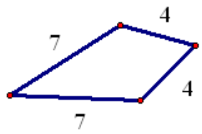
yes both opp $\angle s \cong$



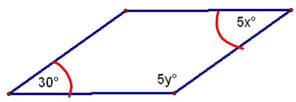
yes (both) opp sides $\cong$



not a ▱



Find x and y so that the quad. is a parallelogram.



$$\begin{array}{r} 180 \\ -30 \\ \hline 150 \end{array}$$

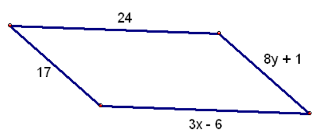
$5x = 30$

$x = 6$

$5y = 150$

$y = 30$

Find x and y so that the quad. is a parallelogram.



Parallelograms on the coordinate plane.

- distance, midpoint, and slope can be used to determine if a quadrilateral is a parallelogram

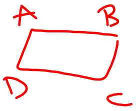
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$ (diagonals bisect) *

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ (determine // or $\perp$)

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(0, 0) B(1, 3) C(5, 3) D(4, 0)



Slope formula

$\overline{AB}$ $m = \frac{3-0}{1-0} = 3$

$\overline{DC}$ $m = \frac{3-0}{5-4} = 3$

$\overline{AB} \parallel \overline{DC}$

$\overline{AD}$ $m = \frac{0-0}{0-4} = 0$

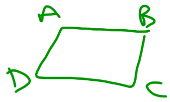
$\overline{BC}$ $m = \frac{3-3}{5-1} = 0$

$\overline{AD} \parallel \overline{BC}$

ABCD is a ▱

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-1, 0) B(3, 0) C(2, -3) D(-3, -2)



Distance formula

$AB = \sqrt{(3--1)^2 + (0-0)^2}$

$16 + 0$

$AB = 4$

$DC = \sqrt{(2--3)^2 + (-3--2)^2}$

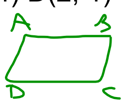
$25 + 1$

$DC = \sqrt{26}$

Not a ▱

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-2, 4) B(-1, -1) C(3, -4) D(2, 1)



Midpoint formula

Check diagonals

$\overline{AC}$ $M\left(\frac{-2+3}{2}, \frac{4+-4}{2}\right)$

$M\left(\frac{1}{2}, 0\right)$

$\overline{BD}$ $M\left(\frac{-1+2}{2}, \frac{-1+1}{2}\right)$

$\left(\frac{1}{2}, 0\right)$

ABCD is a ▱ b/c diagonals bis. each other

A parallelogram has the vertices (-2, -1) (2, 1) and (0, -3). Find all possible coordinates of the 4th vertex.

HW
p421-422
13-19, 22, 25, 28, 29